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In the light of the foregoing it is plain that a new and simple solution of the problem of the rooting of the Teutonic World-Tree can be had by making the three "roots" signify *root-systems*, the first and lowest being in the depths of hell, the second constituting the floor of the region in which men have their abode, and the third being situated just at the top of Cloudland, though still far below the starry abode of the immortal gods. This arrangement perfectly answers to the troublesome statement in the *Grimnismal*: "Hel dwells under one root, the frost-giants under the second, and the race of men under the third." See picture accompanying this paper.

Combining this new interpretation with that which I gave of Bifröst in pp. 155-158 of the work before referred to, and which identifies the bridges of Chinvat, Sirat, Bifröst, etc., with the axis-pillar of the universe, all further objects mythologically associated with Yggdrasil, such as the doomstead of the gods, the two swans, the eagle, the squirrel Ratatösk, the headspring of all the world's waters, the four harts, Nidhögg and the infernal serpents,—all take their appropriate places in the cosmos, and are found to have corresponding symbols in one or more of the world-trees of other mythologies. To the attention of interested scholars I confidentially commend it, stipulating only that they first read the recent account of the world-tree myths given in pp. 992-1018 of John O'Neill's *Night of the Gods*,—a work of immense erudition and of pathbreaking significance.

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#### SOME CURIOUS PSYCHOSENSORY RELATIONSHIPS.

Nearly every one associates with descriptive terms a more or less vivid imagery of the thing or quality denoted. Other people, however, there are who go beyond and possess sensory association values of a peculiar sort—the reference of color (psychic color) to things, words or qualifications outside the color series, or at least independent of any essential objective relationship to it.

And there may be auditory side issues. Some claim to perceive color values according to particular letter sounds, or symbols. Some claim to see color associations in the written characters, which of themselves may be indifferent. I think very few individuals associate sound, or definite musical tones, as predominant to a visual imagery.

This may be because of our visual education being in excess of auditory studies; and the real neglect of the sense of hearing renders us less liable to establish any unusual values in relation to that slighted faculty. But that cross relations do exist is important; it shows to an extent the path of specialization of function, and may indicate future lines of cleavage.

Few will dispute the need of biologic training for the psychologist.

A noted English physician and writer remarks that while once it was customary for all ambitious men to work toward their goal by way of the law, now medicine is offering the training which can best fit the mind to cope with life's problems—in view of modern science, which is largely biologic. Psychology must admit the essential and peripheral basis of consciousness, so that even selfconsciousness may be more widely seated than in the animal brain—although as a coordinating center that organ claims our notice. So it is as a physician, in the broadest sense of the term, I venture to discuss an intricate psychological problem.

Exaggerations or parallelizations of sensory impulses are found more commonly in neurasthenics—those of unstable nervous organization.

With this class of patients must not be confused those individuals of normal strength of structure, but with a plus nervous inherent energy. These also may show curious sense relationships. One class is progenerate; the other, degenerate. Visual acuity, in one, may be below normal—combined with retinal hyperesthesia; or again, with wrong refraction a retinal depression may exist; many physical factors should be considered in casting up our accounts. I recall a case of colorblindness of 50 per cent., reds and greens 80 per cent. and over, in which afterward the sight was found to be different in the two eyes, the right nearsighted or myopic, and the left farsighted or presbyopic—and astigmatism at asymmetric axes!

The boy had never been taught to name colors, and had never seen the world as it is, anyway. On the other hand, with proper refraction, although after twenty years of eyestrain, his vision is over 36/20. I propose to give some of his color associations, before which I would state that in cases in which anisometropia and astigmatism offer difficulties, and in which no histologic or somatic vice exists to suffer thereby, or in which none may be induced, psycho-

centric visual acuity may be increased as a result of the continual efforts rightly to define objects.

He states that

a is fluffy yellow ;	n is shining red ;
b is soft, dull red ;	o is white or pink ;
c is hard, dull white ;	p is dull red ;
d is soft, reddish brown ;	q is pink or grey ;
e is dark pink, or red ;	r is purple ;
f is green ;	s is pale, naples yellow ;
g is red or green ;	t is dark brown, or black ;
h is green ;	u is pale, sky blue ;
i is purple ;	v is green, or yellow ;
j is reddish purple ;	w is dull black ;
k is grey ;	x is yellow or green ;
l is blue, clear and deep ;	y is green ;
m is red or green ;	z is rough, dull black.

On hearing the sounds of the letters he gives another set of color relations, not exactly in accord with the sight of the characters as above. His auditory sense is acute, the result of considerable training in music. A very curious relationship between sound and color will be found to exist, as shown below, which I have determined as the result of purely auditory stimulus.

Arranged to show the spectrum it is as follows ; the compound sounds and diphthongs being analyzed to show their essential elements and with the exact pronunciation indicated in parentheses :

ee (i, Italian)=red ;  
 ay (e, Italian)=light red ;  
 e (ě, as in *red*)=orange ;  
 ai (I, English)=confused yellow-orange ;  
 ah (a, as in *father*)=broad yellow ;  
 au (ow, English)=pale blue and green ;  
 aw (as in *saw*)=green (pale yellowish) ;  
 oh (long ō)=pale blue ;  
 oo (as in *root*)=blue ;  
 yew (u, English)=violet.

It should be noted that from *ee* to *oo* the vocal apparatus passes through extremes. and that at *ah* the vowel is easiest to produce.

I can offer no explanation for this singular crossrelationship. In my opinion the vowels are more emotional than the consonants. In a word's passage through the alchemy of languages the vowels change more broadly than the consonants. That nations in cool

climates are freer in their use of consonants than vowels, I believe is due to a very physical reason, viz., the desire to keep the mouth closed. In warm latitudes there will exist no such necessity, and the vowels are more liable to crop out. Emotion, also, is freer established in the warmer countries, and for many reasons, some of which may be physical. With great emotion there is often a tendency to perspire. In cold countries this would be less desirable because more dangerous. The effects of cold and heat on temperament are undeniable. Granting the relation between consonantal and vowel frequency in the emotions, the striking elision of vowels in Russian and Polish particles might be considered—there occur entire words consisting of undiluted consonants. While in Italy liquids and vowels predominate.

The liquids ought to be considered *vowel* in effort, if *consonantal* in mechanism; those who have studied the mechanism of speech will appreciate what I mean.

The solution of the points at issue would seem to lie in just such mechanical or physiologic variations at the root of tone production. How these enter the chain of associations requires an infinite patience to understand. A certain percentage of cases of color and form association, such as letter signs and the scale of color, I have explained in a peculiar way. I found that the alphabet had been taught from colored squares with the letters printed thereon. A sister of mine retains a vivid color association of this sort which I have proven by a fortunate discovery of the card of letters from which she was taught. In other cases some pronounced effect of the term for a specific color and a predominance of certain letters in that term associates with those letters the given color. In the word *blue*, e. g., with one individual it may be the *l*, with another the *b*, with a third the *u*, that the association is formed.

The relation may be established by hearing the letter, or on its being visualized. In the latter instance the predominance of a letter—a plane figure—will depend on many physiological causes. If any astigmatism or a refraction error exists, in the line of defective axes of vision certain angles will be less pronounced than others. A reference to a test card will show the axis of astigmatism in any case. It will then be provable in what characters the distinctness of visualization will exceed others. So, in a word, certain letters will be more easily visible. Astigmatism is common to most of us, and is a factor not to be avoided.

In analyzing association depending on auditory stimulus the

difficulties are increased by the common lack of understanding of tone relations, absolute pitch, timbre, and overtones in general. That modern harmony depends on a development of the dominant chord is also not generally known. In speech many tones are called upon, and many people actually intone, so that the relations of modern harmony are introduced. If in most of us is born a feeling for certain harmonies and for certain discords it cannot be overlooked that so fundamental a relation enters auditory association change.

We must recognize the method of producing speech. The vowels are made in a series from ee to oo, ee being the vertical narrow sound, and oo the horizontal narrow sound, while ah is the complete round tone. The effect of muscular effort is also to be considered. There is a firmly rooted muscle sense, of *rest*, *weariness*, and *exertion*. Different muscular efforts occurring in the head and face have become associated with definite emotions—the labial, nasal, and ocular external coverings are the muscles of expression. Certainly the vocal muscles are the same—of an expression not visible, but audible.

I think we may proceed in the belief that similar muscular efforts in different individuals give rise to similar impressions; so that if my vocal muscles are muscles of expression and when in use affect me in one way, in the same way another will be affected if he imitate me. But if he is stimulated by the action of my muscles, that is another sort of sensation. Out of any muscular effort in one individual, that is perceptible to another, there come two sets of impressions—an imitative effect, and a percept.

Undoubtedly when one hears or sees a letter sign the effort of producing that sign is coordinated with the percept of it. So that actual muscular effort or a psychic shadow or memory of it, comes into the consciousness in some way associated with the appearance of the character. So that visual and auditory percepts may be combined with a definite motor impulse. The element of protoplasmic contractility, then, is needed to complete any protoplasmic irritable effect. This will be connected with nutritive changes—the element of metabolism. What then of the fourth protoplasmic faculty, reproduction?

This, in an individual organism with reference to itself, is association. If a somatic division were effected, a new individual would be created out of the old. But if the current turn upon itself, as in tissue formation, or in idea association, the reproductive faculty is one of internal economies. The entity or idea within the indi-

vidual is formed in antithesis to the whole. Every idea in consciousness is parallel to changes of somatic activity, in that it is a separation and segregation of forces.

To become self-conscious I insist this separation must be reduplicate, or bilateral, and the brain as a coordinating center for selfconsciousness must, for this reason, be bilateral to offer a sufficient mechanism for self-consciousness. Out of this arises the power of emotion, which I believe has its physical basis in the harmony of two ideal entities, and the effort to harmonize them.

So, when I find astigmatism, I find the emotional person. When I find any marked difficulties in one side of a bilateral sensory tract, the emotional element will be present in that person to the extent of his nervous capability. Emotion may be of a high, sensuous artistic type, or of a low, degenerate, or sensual type; this depends on the fineness of vital fiber. But I want to emphasize the determinism of the fact—not inevitable, but coercive.

Beside astigmatism or auditory defects, nerve conductivity of a variable power may be an essential factor. Neurasthenia, or nerve instability, is founded in its emotional aspect on the difficulty of appreciating stimulus, because of its shifty presentation. The equation of sanity, there, rests on the strength of nerve cells to conciliate the inexactitudes of sense. In these weaknesses and in our efforts to overcome them lie many factors going to overemphasize certain sense appreciations; we value highest what we work most for. If a letter, a sound, a color, or a harmony is more difficult to determine at any moment, in the return of elements present to those circumstances, our memory will re-establish the difficulties we overcame either as such or as the emotions of such.

Colorblindness or faulty naming of color, overcome, in principle or by adjustment, will induce such conditions. Difficulties in forming certain letters or certain combinations of sound will cause them to acquire peculiar emotional values. People who lisp, instinctively come to try to avoid the difficult letter and will often go out of their way to choose the other word. This becomes as much a matter of a way of thinking as of speech. Every throat finds some letters easier of utterance than others. And different languages to different individuals for this reason vary in acceptability. The sense of effect in a language is strongest if the motor lessons were learned with the youthful laying down of emotional faculties.

Some individuals are fortunate in having a relatively normal and symmetric foundation of tissue and a stable nervous organism.

For these, extraordinary sensory relationships are rare—because the physical basis is wanting. In those individuals of either physical defect or asymmetry, or of neurotic constitution, either progenerate or degenerate relations soon crop out. Yet in all of us emotion is a matter of cross-relation in the senses. The effort to establish unity often overpasses original bounds and inundates the entire field of sensory selfconsciousness. The connection between the mechanism of selfconsciousness and the mechanism of consciousness—the latter the universe, and particularly the somatic or body vehicle; and the former the ideal correlation—indicates that our method of analyzing cross-relations must be one of resort to physiologic facts.

I shall take up some elementary sounds and signs showing how they may have a definite emotional basis.

It is true that even in those which refer color to sound, and *vice versa*, there is not an exact or invariable agreement of reference.

Some call the note *A pink*, some *yellow*, etc. But this is no more strange than the different nomenclature of languages in general. On the other hand, certain root words extend through many languages; and *crying*, *laughing*, *singing*, all the world over are the same in meaning. *Muscular effort*, *strain*, *rest*, *pain*, *pleasure* and *satiety* are known to us all and evident in the same expression. From this point it is safe to proceed.

#### A. VOWELS AND EMOTION.

When one is at ease the muscles relax; when under strain of effort or intention, they contract. In saying *ah*, the easiest position of the throat is assumed; *ee* and *oo* are opposite extremities of greatest restriction and tension. *ah-hah-hah* is the easy good-natured laugh. *ee-hee-hee* is the silly, spiteful, or inattentive laugh. *oo-hoo-hoo* is the laugh of derision, dislike or pretension. It is not strange, then, to find *oo* the vowel of hoot, galoot, toot, etc. And *ah*, the vowel in *pater*, *mater*, *frater*, etc., the home words. And *ee*, the vowel of *cheat*, *dead-beat*, etc. These words recommend themselves for what they express. It is true, secondary reasons may place a vowel where its effect is contrary to the general rule. Perfection is not yet. Things will always be seen in the making, and processes are makeshifts.

Moreover, the vowel sounds have a curious power of becoming subjective or objective in significance. The sound of *ee*, for instance, may have a favorable significance, or an unfavorable one. It may mean *slight*, *small*, *insignificant*, *exact*; or it may mean *small*, *mean*,



*unpleasant, exacting.* The sound *ee* is that of diminutives as in *wee*. The Italian *ino* and *ina* are examples of this; but the *ee* sound in this use is common to most languages. It seems to particularize.

The sound *oh* is of *increment, enlargement, or extension*. Viz., teeny, leetle (little), miserable (meeser-), etc., and *flowing, going, showing, blowing, growing, oh-hoh-hoh!*

All of this, I believe, is largely a result of muscular reflex effect. Before going on with a further analysis I want to append a table of the significance of the vowels as shown in laughing.

## SIMPLE VOWEL SOUNDS.

ee-hee-hee: self-conscious, approaching;  
ih-hih-hih: unregarding, overlooking;  
ěh-hěh-hěh: careless, diminishing;  
äh-häh-häh: ease, juncture;  
ah-hah-hah: completeness, lack of strain;  
aw-haw-haw: reflexive;  
űh-hűh-hűh: minimizing;  
ōo-hōo-hōo: distancing, outstanding.

The compound vowel sounds introduce a more thoughtful element, and are usually more distinctive in expression.

## COMPOUND VOWEL SOUNDS.

ah-ee (I) hi-hi: calling attention at a distance;  
eh-ee (ey) hey-hey: calling attention to that near;  
ah-oo (ow) how-how: disturbance, disruption;  
aw-oo (oh) hoh-hoh: surpassing, denying;  
aw-ee (oy) hoy-hoy: bringing near, coordinating.

In the analysis, it must be remembered that the impressions of vowel sounds will be modified by the nature of the meaning of the word—if the meaning of the word, and the consonantal effect of it corresponds with the vowel emotion the reinforcement of impression is notable.

Cf. the effect of *oh* in *most, noble, notable, notorious, no*, etc., with *mist, nibble, "nit"* (not), in the letter of which a decided contraction or reduction is apparent. Take the following of Robert Louis Stevenson's:

"So long as we love, we serve. So long as we are loved by others I would almost say we are indispensable; and no man is useless while he has a friend."

In this the *oh* influence of *so*, *almost* and *no* is striking. To replace these effective sounds with an *ih* value would remarkably reduce the breadth of expression. I think we should take the above as illustrative of the fact that the highest interest will settle around sympathetic vowels. If these vowels are contained in less important words there will not be the same acuity of expression as in cases in which it does. I think it may be said that all magnanimous words enjoy the center of the vowel scale (*vide supra*), and that their effect is reinforced by such a station.

While the *oo* extremity tends to subjective direction and the *ee* to objective analysis, the effect of the latter is to emphasize the relation of the speaker to the second or third person; and of the former, the relation of the second or third person to the speaker.

In that muscular sense is real and peripheral, and because of its connection in this matter, the horizontal and vertical mechanism of the *ee* and the *oo* sounds must be recalled. The sense of gravity in station and the horizontal placing of the two paired sense-organs of sight and hearing, combined to emphasize these differences. The common use of terms of geometric relation to character, such as "breadth," "narrowness," "height of mind," "depth of villainy," etc., show that these are rooted in our psychomechanism. It is clear that the governing influences are both from within and from without, but all experience is arrived at from without and modified by the nature of the organism.

The consonants afford an interesting study. Labials are used for terms of *accretion*, *acceptance* or *nearness*. Pater, frater, mater.

The dentals are specifying or distinctive sounds—pointing out, or marking off. Gutturals are not so definite. The dentals are of higher specific gravity than gutturals, which may be described as less highly organized, consequently vaguer, at the same time more emotional, or passionate.

I adjoin a list of impressions of the numerical series, obtained from some dozen people:

## ON SIGHT.

	WEIGHT	SIZE	SHADE	DENSITY
1	lightest 50%	smallest 60%	reddest 10%	—
2	—	—	greyest 20%	—
3	—	—	whitest 10%	roughest 40%
4	heaviest 20%	largest 10%	reddest 70%	hardest 70%
5	lightest 20%	smallest 30%	whitest 40%	hardest 20%
6	—	—	greenest 20%	softest 70%
7	lightest 30%	—	greenest 80%	—

8	heaviest 60%	largest 70%	yellowest 80%	smoothest 30%
9	heaviest 20%	largest 10%	darkest 80%	—
0	—	smallest 10%	whitest 60%	smoothest 40%

## ON HEARING.

	WEIGHT	SIZE	SHADE	DENSITY
1	—	smallest 10%	—	smoothest 50%
2	lightest 40%	smallest 30%	darkest 30%	smoothest 20%
3	—	—	—	—
4	heaviest 10%	largest 40%	—	—
5	—	—	—	roughest 40%
6	—	—	—	—
7	—	—	—	—
8	heaviest 40%	—	—	—
9	—	—	darkest 30%	—
0	heaviest 30%	—	—	roughest 40%

Owing to uncertainty in some tests these results are incomplete. But that the cross-relations do exist is certain.

Something of the mechanism of self-consciousness must be understood before we can trace out such hidden currents as these psychosensory suggestions.

I believe that every idea has its basis in a combination of physiologic units on or in which the idea is, but it is not the combination of units. The organism develops from protoplasm, whose faculties are four, and the organism whose histologic units are four would seem to have also four psychic facultative manifestations. Irritability, contractibility, metabolism and reproduction are the *addition*, *subtraction* and *division* of the cell. Epithelium, muscle, connective tissue, and nervous tissue are the corresponding higher powers to which they become raised in physiologic evolution. In the mind they become *sense*, *will*, *understanding* and *ideation*. The analogy between ideation and tissue formation, by means of internal reproduction and self-inclusion, is to be held up before us. Every sensation is grasped and the several sensations which are coordinated to become ideal grow out of what constitutes the psychosensory mechanism.

In neurasthenics or those of unstable nervous organization, peripheral balance, or central control wavers. Differing strengths of nerve conductivity, and different powers of conductivity in a nerve or parts of a nerve, are factors which may combine to blur the keenness or exactitude of idea correlation. Certain elements of psychic friction, in consequence, are to be accounted for. De-

fects or abnormalities of physical structure other than of nerve tissue may be important to know.

Some of us experience greater ease in pronouncing certain sounds than others. Certain dialects come to be on account of racial preferences for certain sounds or syllables. The sibilants and the dentals interchange. Gutturals fade out altogether, or may be accentuated; e. g., *thalassa* or *thalatta*, in the Greek for "sea"—*durch* and *through*—*lake* and *loch*, etc.

When, therefore, an individual deviates from conventional usage, he is judged by others according to their accepted expression. The lisping man is called effeminate, or weak, because his enunciation is not fully formed. So lisping sounds become symbolic of the weaker or less mature emotions. Take for instance the word racial, which is not usually pronounced with the *s* sibilant, but with the *sh* sound.

The accentuation of consonants may indicate the uncouth, the rough, the barbaric, because we associate any overmuscularity with such sorts of people.

*Audition colorée* is an example of excessive associative power, and is the result of insufficient balance of association whereby the less near is approached because of the loss of what commonly should have been interassociated. Like all such manifestations, I find it varying to suit climatologic changes and body states of being. The epileptic hair-trigger of emotion is easily lost control of.

Whatever the power that governs karyorexis in the cell it is this which in the cerebral organism controls ideation. So that pathology and teratology are paralleled in the formation of ideas by psychic and sensational masses instead of tumors—sarcomas, carcinomas, or warts, and eruptions.

One will never be able to point out such and such a brain-cell as representative of such and such an idea, but I believe the future will chart out the mechanism of self-consciousness in terms parallel to benzol rings, and other organochemic formulas.

So that the psychologist or physiologist alone will not be able to work this out—the future means an interdependence of their efforts—and their success.

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[The author wishes to thank Dr. Wm. Wadsworth, in whose laboratory at the University of Pennsylvania in 1896-7 the beginning of the above study was accomplished. T. H. E.]